

# Methane Compliance Solution

## Designed for OGMP 2.0 Gold Standard

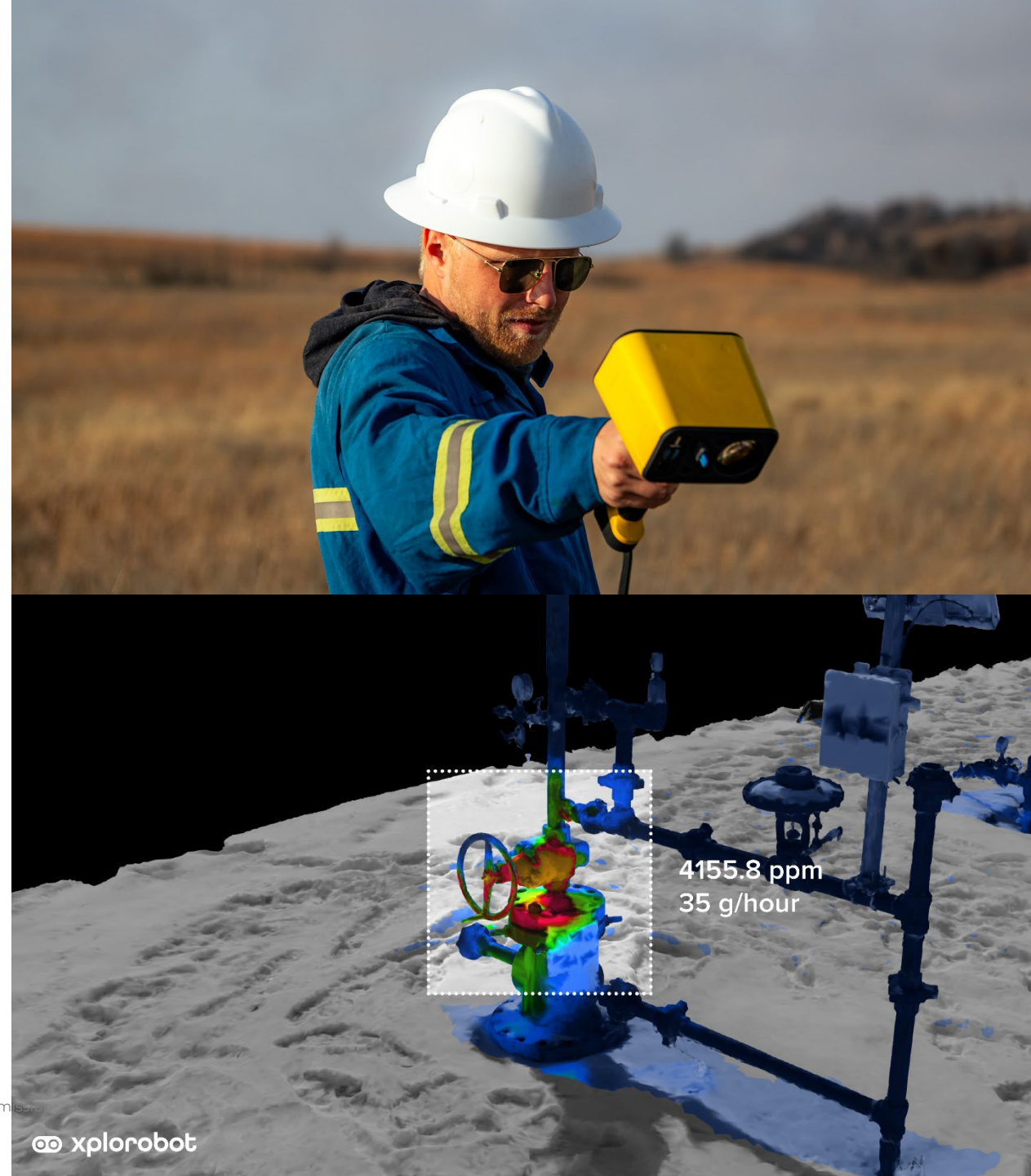
June 12, 2024



# Xplorobot delivers a fully digital methane emissions detection and quantification solution

## Key Advantages:

- Complies with US EPA 40 CFR Part 98 Subpart W
- EPA Alternative Test Method for OOOOb/c in progress, and Colorado AIMM submitted and in process
- 10X more affordable than infrared OGI devices
- Deployable by any operator as part of routine duties—no special certification required
- Most accurate detection technology per METEC results (92% true positive, 2% false positive)
- Highly sensitive with a 1 gram per hour detection limit
- Fully digital from field to ERP, documenting Digital Emission Tags and automating emission tracking and reporting



# Xplorobot Laser OGI matches the performance of IR OGI used by highly experienced inspectors

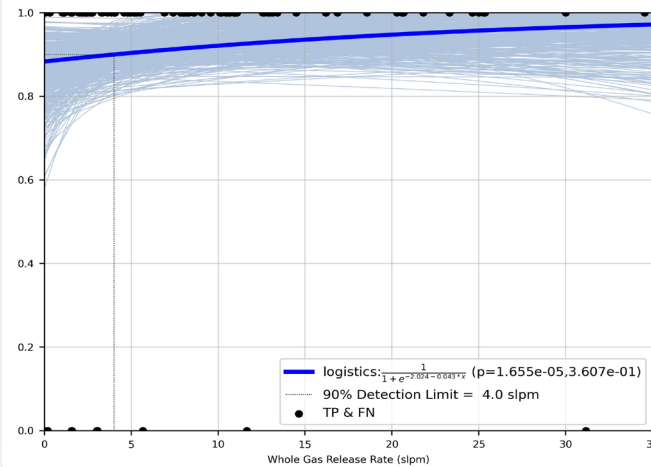
## Xplorobot Laser OGI

Accepted for emissions monitoring under US EPA Title 40 CFR 98 Subpart W



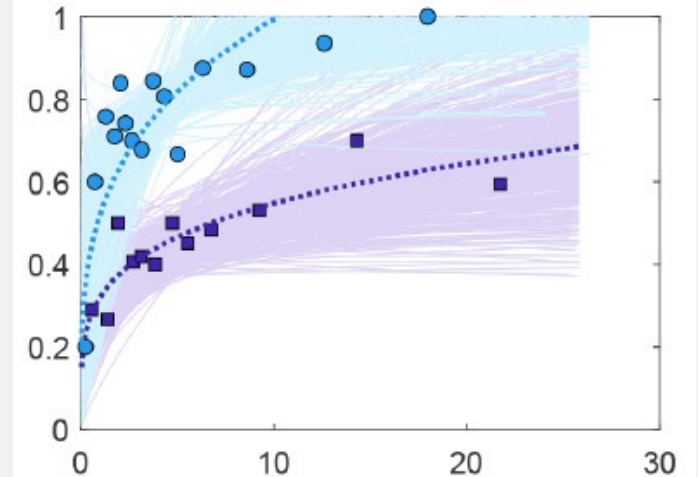
## Xplorobot METEC Results

Xplorobot team, being novices in LDAR inspection, achieved the 90% confidence detection level of 4.0 lpm using Xplorobot Laser OGI



## IR OGI METEC RESULTS

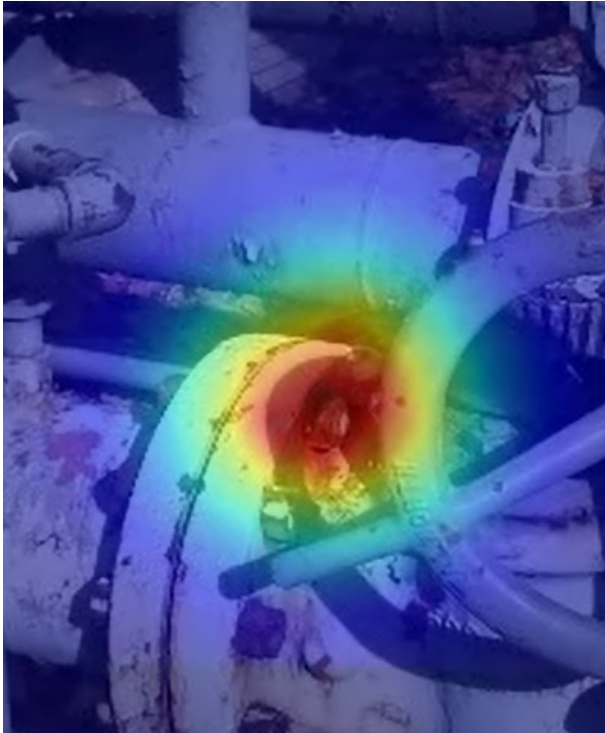
“High experience LDAR surveyors (700-4000 surveys) with infrared OGI cameras achieved 90% confidence detection level between 2.6 lpm and 7.7 lpm.”



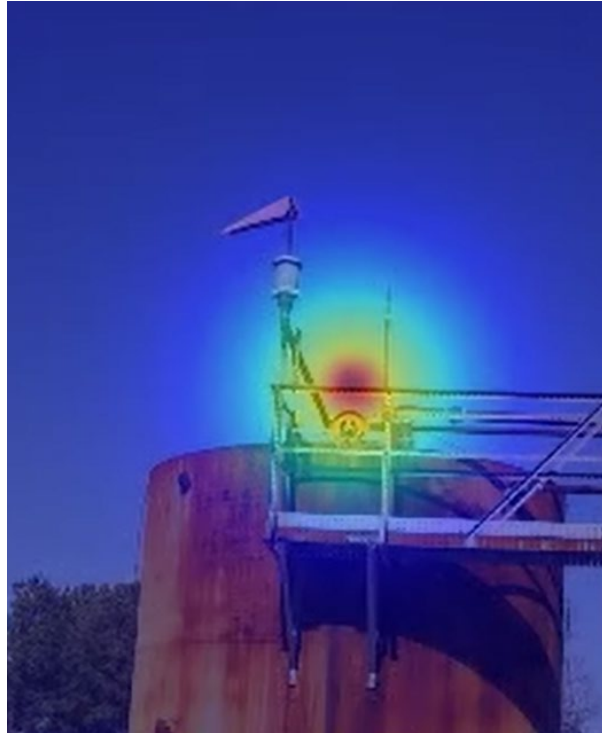
Zimmerle, Vaughn, Bell, Bennett, Deshmukh, and Thoma. Detection Limits of Optical Gas Imaging for Natural Gas Leak Detection in Realistic Controlled Conditions. *Environmental Science and Technology*, 54, 2020.

# Xplorobot Laser OGI Digital Emission Tag Examples

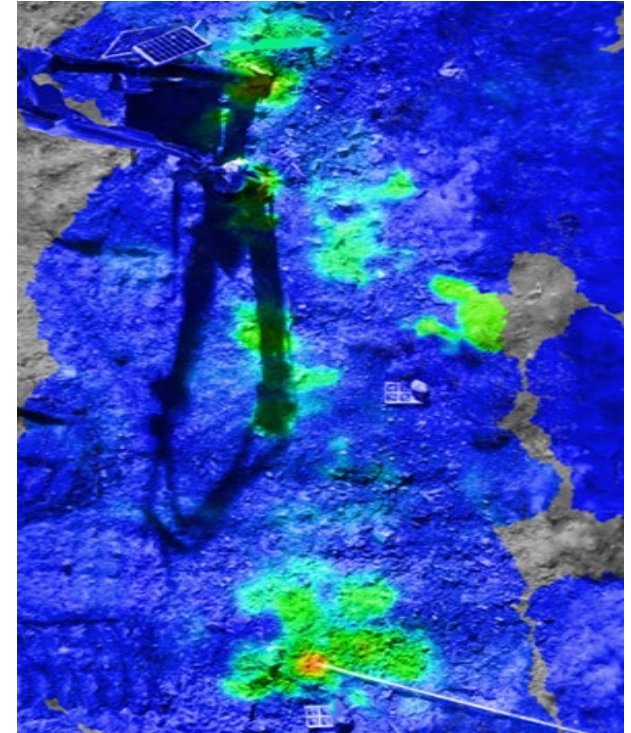
Localization down to a bolt



Emission on tank from the ground



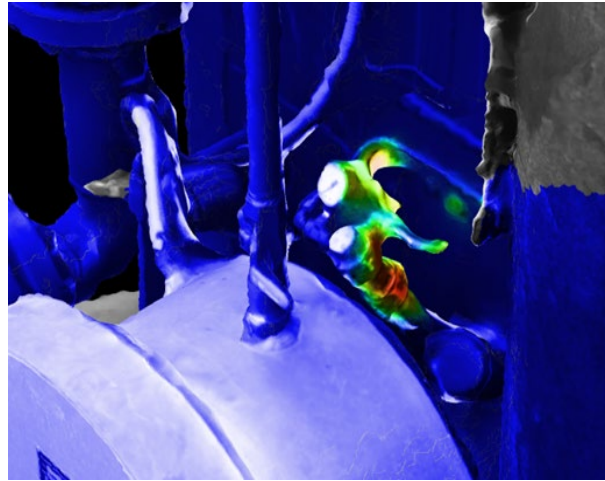
Emissions not visible by OGI



# Xplorobot improves economics under EU regulations by detecting emissions of 1 gph in field conditions

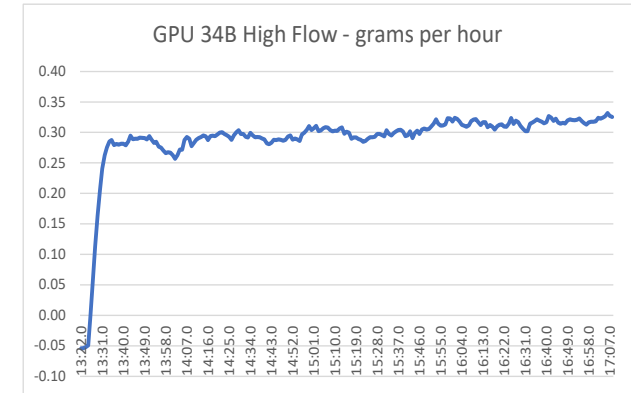


Emission visualization on the screen of the Xplorobot Laser OGI



## 3D Analysis and Quantification

Max Concentration: 269 ppm-m  
Emissions Rate Estimate: 0.8 gph



## Validation Using Semtech Hi-Flo Device

Emissions Rate: 0.3 gph

**\*Under EU regulations 1gph [Xplorobot] inspection interval is 8 months, 17 gph [IR OGI] is 4 months**

# U.S. Government Agency Campaign Results



## Results:

**Efficient Deployment:**  
57 orphaned wells scanned in 3 days.

**Emission Rates Detected:**  
Ranged from 0.3 g/h to 1,118 g/h.

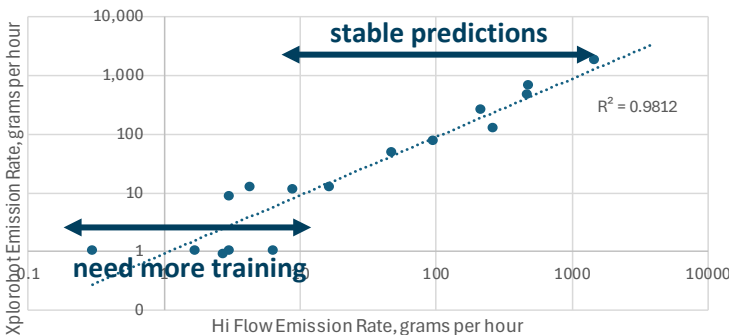
**Average Emission Rates:**  
184 g/h per source and 52 g/h per orphaned well.

**Accurate Emission Rate Predictions:**  
Down to 10 g/h.

\*Further neural network training is required to improve predictions below 10 g/h.

Well Name	Hi Flow Emission Rate g/hr	FLIR - detection	Xplorobot detection
Porter Run 2	Zero Emission	Zero Emission	Zero Emission
Rutherford Nancy 2	1.0	No detection	Detection
Private #7	1.0	No detection	Detection
Private #2	1.0	Not tested	Detection
USA Joy 1	1.0	No detection	Detection
Edward Wiles #3	1.4	Not tested	Detection
USA #19	2.0	Not tested	Detection
Martin James #1	2.0	No detection	Detection
Edward Wiles #3-Separator	2.4	Not tested	Detection
Private #3	4.0	Not tested	Detection
Rutherford Nancy 3	8.0	No detection	Detection
Private #1	20.0	Not tested	Detection
Holiday Rueben #6	24.0	No detection	Detection
Zwick Bros #3	24.0	Not tested	Detection
Grace Joy 1	52.7	Detection	Detection
Undocumented 1	58.5	Detection	Detection
Private #5	100.0	Detection	Detection
Private 8	600.0	Detection	Detection
Charles Hall #6	800.0	Detection	Detection
Westbrook WMB	1,200.0	Detection	Detection
Private #9	1,600.0	Not tested	Detection

Xplorobot vs Hi Flow - Osage Nation Campaign



# Enabling OGMP 2.0 Gold Standard

## Digital database of components and sources

### Full digital record of inspections—emission sources and compliance by component

Every component scanned is digitally captured and identified by a machine learning algorithm

Component results, along with their locations and identification, are stored in a database for audit or reconciliation

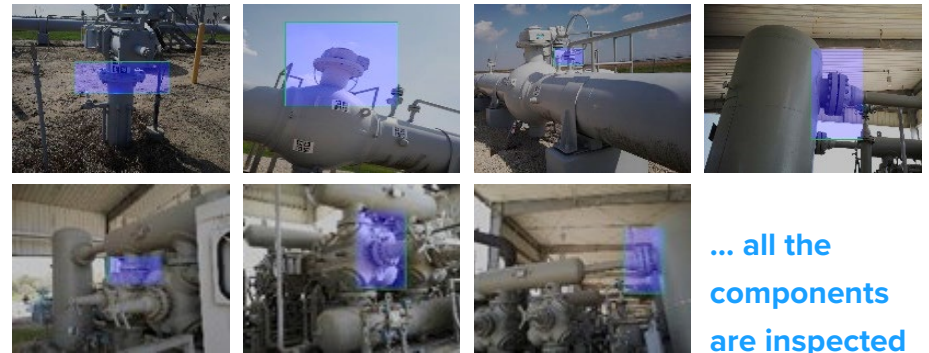
Inspection coverage can be confirmed from the database, indicating the percentage of components scanned

Walking route can be verified using GPS data

Dwell time is determined digitally from the data

**Complete auditability of all inspection results.**

### Components in compliance



... all the components are inspected

### Emission Sources



## Subpart W: Leak/No-Leak Reporting

### Reduce emissions and penalties up to 20X for prudent operators

#### Reporting and penalty reduction under Subpart W

- Leaker/non-leaker emissions factors **reduce the calculated emissions**
- Regular inspections conducted by operators as part of the routine duties enable faster repairs and **reduce the actual emissions**
- Efficient notification (digital emission tags sent to maintenance crew by email) **reduce mitigation times**
- Shocking penalty reductions **according to our client calculations**

#### Intermittent bleed pneumatic devices example

	scf/hr	g/hr	tons/year	
Default leaking/non-leaking	8.8	169	1.5	
OR				
Leaking intermittent bleed pneumatic device	24.1	463	4.1	
Non-leaking	0.3	6	0.050	
Let's assume the probability of leaking	5%			
			Tons per year	
	Devices		Default emissions	Leaking/non-leaking
1 pad - 3 pneumatic devices	3		4.4	0.2
Small producer - 100 pads	300		444	20.1
Medium producer - 1000 pads	3,000		4,440	201.4
Large Producer- 35,000 devices	30,000		44,400	2,014.0
Penalty per ton			\$900	\$900
Potential penalty for Small producer	300		\$ 399,600	\$ 18,126
Potential penalty for Medium producer	3000		\$ 3,995,997	\$ 181,258
Potential penalty for Large producer	30000		\$ 39,959,967	\$ 1,812,578

# OGMP 2.0 Top-down vs. Bottom-up Reconciliation

## Requires accurate tools and component-level database

### Reconciliation Challenge

- Increasing accuracy of aerial technology will lead to greater challenge of reconciliation
- Even a 200 grams per hour per pad discrepancy leads to large number for multi-pad operators (200 gph/pad x 1000 pads = 200 kg/hour)
- Defending against 3<sup>rd</sup> party claims and penalty challenges will require a digital record of compliance per component

### Real Client Example

- **Client LDAR team:** 6 emission points identified
- **Xplorobot LDAR novices:** 20 emission points identified
- **Emission difference:** 1.2 kg/hour (about 250 gph per emission point)
- **Conclusion:** Small emission points add up fast!

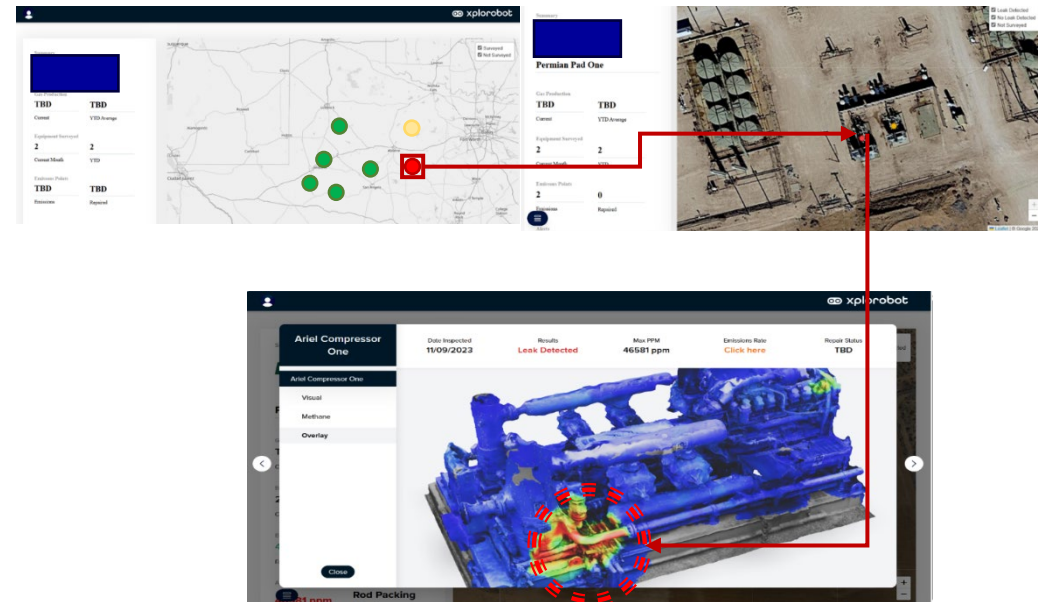
# Xplorobot Compliance Solution

## Value Proposition

- Simple cost-effective tool that can be used by any operator
- Superior detection capabilities
- Emission estimation for each source
- Full digital database of components in the field
- Digital records of compliance per component to protect you against claims and penalties
- Bottom-up to top-down reconciliation based on real data

...and we can ingest data from hand-held infrared OGI cameras

### Xplorobot Digital Emissions and Compliance Database





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